

REMARKS

This responds to the Office Action dated on August 28, 2007.

Claims 1, 9, 15, and 23 are amended. Claims 7, 8, 21, and 22 are canceled. Claims 1-6, 9-20, and 23-28 are now pending in this application.

In the Specification

The specification has been amended to update the priority information of the co-pending applications. No new matter has been added.

§102 and §103 Rejections of the Claims

Claims 1, 4-6, 11-13, 15, 18-20 and 25-27 were rejected under 35 U.S.C. § 102(e) for anticipation by Oung et al. (U.S. Patent No. 7,079,888) or in the alternative, under 35 U.S.C. § 103(a) as obvious over Oung et al. (U.S. Patent No. 7,079,888). Claims 1-8, 10-22 and 24-28 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Levine (U.S. Patent No. 6,865,414) in view of Oung et al. (U.S. Patent No. 7,079,888). Claims 9 and 23 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Levine (U.S. Patent No. 6,865,414) and Oung et al. (U.S. Patent No. 7,079,888) as applied to claims 1 and 15 above, and further in view of Jensen (U.S. Patent No. 6,941,332). The rejections are traversed and reconsideration is respectfully requested.

As amended herein, independent claims 1 and 15 recite a method and device, respectively, in which BB intervals are filtered before being used to compute heart rate variability metrics by a filtering algorithm that both prevents ectopic beats from corrupting the data used to compute the heart rate variability metrics and is responsive to changes in a patient's sinus rhythm. The filtering algorithm is primarily described in the specification with reference to Fig. 2. Claims 1 and 15 recite that the BB intervals are filtered to exclude particular BB intervals as ectopic using a first-in-first-out buffer for storing a plurality of previous BB intervals and from which a statistic is computed, where the buffer can contain a maximum number N of such preceding BB intervals, by: 1) acquiring a present BB interval, 2) if the buffer contains less than N intervals, classifying the present BB interval as indeterminate, updating the buffer with the indeterminately classified BB interval, and returning to step 1, 3) if the buffer contains N

intervals, comparing the present BB interval to the computed statistic, 4) excluding the present BB interval as an ectopic interval if the present BB interval is greater or less than the computed statistic by the specified threshold value, discarding the oldest BB interval in the buffer, and returning to step 1, 5) updating the buffer by removing the oldest BB interval and storing the present BB interval therein if the present BB interval is not excluded as ectopic and then returning to step 1. This filtering algorithm excludes a BB interval that varies too much in comparison with previous BB intervals from being used to compute heart rate variability metrics. The algorithm also prevents an out-of-range BB interval from corrupting the filtering of subsequent BB intervals by not updating the buffer with BB intervals that are classified as ectopic. At the same time, the algorithm is able to adapt to the normal variations in a patient's sinus rhythm by updating the buffer with BB intervals that are classified as indeterminate when the buffer is not full but not using such indeterminate intervals for computation of heart rate variability metrics.

Applicant believes that the recitations of claims 1 and 15, as amended herein, are neither anticipated nor rendered obvious by the prior art of record. The Office Action asserts that Levine teaches comparing a beat-to-beat interval with a moving average of previous beat-to-beat intervals in order to detect ectopic beats, that Oung teaches computing a heart rate variability metric, and that it would have been obvious to combine the teachings of Levine and Oung to arrive at the subject matter recited by the pending claims before the present amendment. Applicant reiterates the remarks relevant to this point made in response to the previous Final Office Action. In addition, however, Applicant asserts that no combination of teachings in the prior art of record would result in the subject matter as now claimed. For example, Applicant can find no teaching in either the Oung or Levine reference that relates to the specific technique of filtering BB intervals using a FIFO buffer where: 1) when a BB interval is classified as ectopic, the ectopic BB interval is not used to update the buffer and the oldest BB interval in the buffer is discarded, and 2) a BB interval is classified as indeterminate when the buffer is not full, where such indeterminate BB intervals are used to update the buffer but are not used to compute heart rate variability metrics. Applicant can also find nothing in the cited references that relates to the use of specified upper and lower limit values in addition to the statistic computed from the FIFO buffer in classifying BB intervals as recited by claims 9 and 23.

As explained above, Applicant believes that the filtering algorithms recited by claims 1, 9, 15, and 23 are especially advantageous in computing heart rate variability metrics and that there is no teaching or suggestion of such algorithms in the prior art of record. Furthermore, the simple moving average filter for detecting PAC's described in the Levine reference represents an inferior alternative to what is presently claimed and actually teaches away from it. Applicant further believes that the recitations of dependent claims 2-6, 10-14, 16-20, and 23-28 are neither taught nor suggested by the prior art in the context of their combination with the subject matter of independent claim 1 or 15. Withdrawal of the rejections is respectfully requested.

CONCLUSION

Applicant respectfully submits that the claims are in condition for allowance, and notification to that effect is earnestly requested. The Examiner is invited to telephone Applicant's attorney at (847) 432-7302 to facilitate prosecution of this application.

If necessary, please charge any additional fees or credit overpayment to Deposit Account No. 19-0743.

Respectfully submitted,

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CERTIFICATE UNDER 37 CFR 1.8: The undersigned hereby certifies that this correspondence is being filed using the USPTO's electronic filing system EFS-Web, and is addressed to: Mail Stop Amendment, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on this 28 day of December 2007.

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